

H500-CE/BK USER MANUAL

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1. OVERVIEW

The H500-CE/BK is a security device designed to support secure authentication and storage, and a multitude of personal and business uses, such as:

- strong two-factor authentication
- secure private data storage
- digital certificate storage
- online transaction authorization and signing
- Bluetooth proximity-activated functions.

The H500-CE/BK can be easily accessed and controlled by custom applications running on client devices (smart phone, tablet or PC) by connecting over Bluetooth or using a micro USB cable. Any compatible business logic can be enforced by the client application using the H-500 middleware to access the H-500 firmware to support the following functions:

- configure multiple flash partitions (CD-ROM, Public, Private, Hidden, Read-only)
- map the RGB LED and function button to business logic requirements
- establish a secure channel with the H500 middleware
- provide an encrypted File System for storing crypto keys and secure objects
- support shared access from multiple client applications via PKCS# v.2.2
- export cryptographic operations (AES, 3DES, SHA-1, SHA-256, RSA-1024, RSA-2048, PKCS#1 encryption and signing, ANSI 9.31 CS RNG)

1.1 LOOK & FEEL AND USABILITY

With reference to Figs.1-2, the H500-CE and H500-BK differ only slightly in the shape and materials used for the device housing, but share the same internals (components, schematics, PCB, etc.) and the user interface elements (namely, the function button and the ultra-bright, multi-color LED). The devices are powered by a 3.7V Lithium-Polymer high capacity rechargeable battery to support usage in connected and disconnected modes with both computers and mobile devices. The small size and weight, combined with the powerful on-board feature set, allow maximum portability and ease of use at home, in the office and on the road.

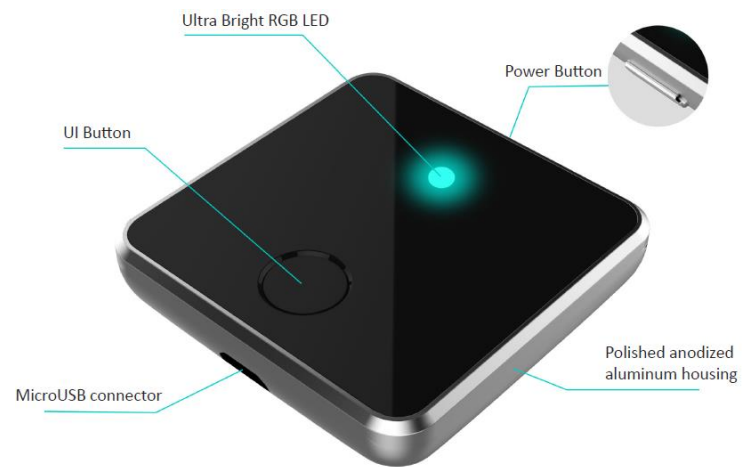


Fig. 1. The H500-CE device



Fig. 2. The H500-BK device



2. H500-CE/BK STATES & TRANSITIONS

The H500-CE/BK devices communicate the operating status to the User through a combination of LED colors and pulsing frequencies. Each LED color-frequency association is linked to one and only one main operational state.

2.1 LED COLORS

- WHITE Business logic notifications
- RED Battery Level notifications
- ORANGE Charging notifications
- BLUE Bluetooth notifications
- GREEN USB notifications

2.2 LED FREQUENCIES

- SLOW PULSE Slowly switching on-off (1 pulse every 2 seconds)
- PULSE Switching on-off (1 pulse per second)
- FAST PULSE Quickly switching on-off (2 or more pulses per second)
- SOLID Steady

2.3 BATTERY LEVELS

- FULL: Battery is fully charged
- OK: Battery has enough charge to allow extended usage
- LOW: Connect to charger as soon as possible (less than 20% charge left)
- EMPTY: The device cannot operate without first being fully charged

2.4 LED STATES

Please, see Table 2.1 on the next page.

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**Table 2.1 H500-CE/BK LED States**

NAME of STATE	LED	WHAT YOU SEE	WHAT IT MEANS
<i>While the device is connected to the wall charger:</i>			
FULLY CHARGED		Solid orange light	The battery is fully charged
CHARGING 80%		Fade-in orange light 2 steps	The battery is charged at 80%
CHARGING 50%		Fade-in orange light 3 steps	The battery is charged at 50%
CHARGING LOW		Fade-in red light from dark red	The battery is charged at 20%
CHARGING EMPTY		Fade-in red light from OFF	The battery is charging but almost empty
<i>While the device is powered ON from battery:</i>			
EMPTY		Fast pulsing red light then OFF	The battery level is too low to operate the device.
BT STANDBY		Slow fade-in, fade-out blue light	Ready to connect over Bluetooth
BT ACTIVE		Solid blue light	Connected over Bluetooth
BT TRANSMITTING		Fast pulsing blue light	Transferring data over Bluetooth
<i>While the device is connected to the USB port a PC:</i>			
USB STANDBY		Slow fade-in, fade-out green light	USB port is in suspend mode
USB ACTIVE		Solid green light	Connected over USB
USB TRANSMITTING		Fast pulsing green light	Transferring data over USB

Note: when the battery needs to be charged, a short intermittent red pulse will be visible in the Standby, Active and Transmitting color states listed above



3. H500-CE/BK LITHIUM-ION BATTERY

Lithium-ion batteries are a newer type of battery now used in most of consumer electronics devices. Lithium-ion batteries offer a wide array of benefits and, compared with traditional battery technology, they charge faster, last longer, and have a higher power density for more battery life in a lighter package.

3.1 USAGE GUIDELINES

Avoid extreme ambient temperatures:

Lithium-ion batteries perform well in a wide range of ambient temperatures, with 15° to 25° C as the ideal range. It's essential to avoid exposing the H-500 device to ambient temperatures higher than 35° C: operating and charging at such high temperatures may permanently damage battery capacity. Similarly, storing the device in a very hot environment can also damage the battery irreversibly. Using the H-500-CE/BK in cold temperatures may cause the battery to discharge faster, but this condition is temporary. Once the battery's temperature returns to its normal operating range, its performance will return to normal as well. The reason for this behavior is that batteries function via a chemical reaction that occurs inside their sealed foil envelopes. Since the chemical reaction doubles its speed for every ten degrees increase of ambient temperature, lithium-ion batteries don't perform as well in cold weather and may degrade faster in hot climate.

3.2 LONG TERM STORAGE GUIDELINES

Store half-charged for long term:

When storing the H-500-CE/BK device long term, a few key factors will affect the overall health of the lithium-ion battery, in particular the environmental temperature and the percentage of charge on the battery when it's powered down for storage. Please follow these guidelines:

- Do not fully charge or fully discharge your device's battery, but rather charge it to around 50%. If you store a device when its battery is fully discharged, the battery could fall into a deep discharge state, incapable of holding a charge. Conversely, if you store it fully charged for an extended period, the battery may lose some capacity, leading to shorter battery life.
- Power down the device to avoid additional battery use and place it in a cool, moisture-free, environment at a temperature less than 30° C.
- If storing the device for longer than six months, make sure to recharge it to 50% every six months. Depending on how long you stored the device, it may be in a low-battery state when you remove it from long-term storage and it may require several minutes of charging before it reaches the optimal charged range.

DISCLAIMER

Allowing the battery to fully discharge down to the EMPTY state will reduce the battery's lifetime and require a lengthy recovery procedure (ref. section 4.4)



4. OPERATING WITH THE H500-CE/BK

4.1 ACTIVATING BLUETOOTH TRANSMISSION

To activate Bluetooth on the H500-CE/BK, keep the device disconnected from any other equipment. Press the power button and release it when the LED shows a blue light. The Bluetooth chip and associated components will power up and bring the device in the BT Active state (ref. Table 2.1). The H500-CE/BK device is now discoverable as a Bluetooth device with which you can pair and connect with. After maximum 3 minutes without any connection over Bluetooth, the H500-CE/BK will automatically switch OFF to save battery power.

NOTE

The H500-CE/BK supports the BR/EDR and LE Bluetooth modes. However, both modes cannot be supported at the same time. After connecting in one mode, the device should be turned OFF and unpaired before it can be connected in another mode on the same device.

4.2 USING THE H500-CE/BK AS MASS STORAGE DEVICE

To use the H500's mass storage, connect the device to the USB port of any working PC. When the device detects a connection over USB it will switch to USB Active state (ref. Table 2.1) and the LED will start emitting a green light.

In this mode, after the required drivers are automatically loaded by the operating system, a new 4GB, 8GB, 16GB or 32GB mass storage partition will be mounted on the PC and become accessible for reading/writing data.

After maximum 3 minutes in USB Standby mode without reconnection, the H500-CE/BK will automatically switch OFF to save battery power.

4.3 CHARGING THE BATTERY

To charge the H500-CE/BK battery, connect the device to the USB port of any working PC or to a wall-charger adapter.

While connected to a PC, the H500-CE/BK will be charged only after it is properly configured and mounted by the operating system. With reference to the H500-CE/BK States Table 2.1, charging will occur only in the USB Active and USB Transmitting modes.

While connected to a wall charger, the H500-CE/BK will start immediately charging and communicate its state as shown in the H500-CE/BK States Table 2.1.



4.4 RECOVERING A FULLY DISCHARGED BATTERY

If the battery of the H500-CE/BK was left to discharge below the EMPTY state, it will need to be recovered by connecting it to a PC or a wall-charger adapter. During the battery recovery, the LED will not light up and charging will continue until the power is raised at least up to the EMPTY level.

The H500-CE/BK will continue operating in two possible connection states:

- when connected to a wall-charger, it will continue charging
- when connected to a PC, charging will continue only in the USB Active and USB Transmitting modes

NOTE

During the recovery procedure, the LED will not light up. Please allow at least 30 min for a complete recovery of a fully discharged battery.



5. H500-CE/BK TECHNICAL SPECIFICATIONS

5.1 SUPPORTED OPERATING SYSTEMS

PC based OS - USB connection:

- Windows Vista x86 and x64
- Windows 7 x86 and x64
- Windows 8 x86 and x64
- Windows 8.1 x86 and x64
- Windows 10 x86 and x64
- OSX 10.7
- OSX 10.8
- OSX 10.9
- OSX 10.10
- OSX 10.11
- OSX 10.12

Mobile OS - Bluetooth connection:

- iOS 8.x
- iOS 9.x
- iOS 10.x
- iOS 11.x
- Android 4.x
- Android 5.x
- Android 6.x
- Android 7.x
- Windows Phone 8.x
- Windows 10 Mobile

5.2 TECHNICAL CHARACTERISTICS

5.2.1 Main Processor

- 32-bit ARM Cortex M3 with 120MHz, up to 1MBytes Flash (ROM) and up to 128 kBytes RAM
- USB 2.0 High Speed
- True Random Number Generator

5.2.2 Power Supply

- Lithium-Polymer high capacity rechargeable battery (450mAh)
- Fast charging through micro USB from host PC and wall charger adapter
- Certification for Transport of Goods (UN38.3)

5.2.3 Bluetooth

- Compliant with the Bluetooth 4.1 Specification
- Supports protocols and profiles SPP (over BR/EDR) and GATT (over LE) protocols
- Best-in-Class Bluetooth (RF) performance
 - Temperature Compensation to Ensure Minimal Variation in RF Performance
 - Minimum Adaptation Time for Adaptive Frequency Hopping (AFH)
- Advanced Power Management for Extended Battery Life:
 - Low Power Consumption for Active, Standby, and Scan Bluetooth Modes
 - Shutdown and Sleep Modes to Minimize Power Consumption



5.2.4 Miscellaneous

- SSCD-ready (optional)
- RGB (multi-color) LED on the front panel
- Function UI button on the front panel
- Micro USB port
- Power button
- Flash mass storage up to 32 GB

5.2.5 Certifications

- USB-IF
- CE, FCC,
- RoHS, WEEE

5.3 FIRMWARE

- Custom developed with focus on security, performance and power usage
- Secure Second Level Boot loader to boot only a validly signed Firmware
- Multiple flash partitions (CD-ROM, Public, Private, Hidden, Read-only)
- Access to Mass Storage over USB 2.0 High Speed
- Access to device/partition management controlled by Business Logic Module
- Customizable states using the RGB LED and function button
- Customizable Business Logic Module
- Exports cryptographic operations (AES, 3DES, SHA-1, SHA-256, RSA-1024, RSA-2048, PKCS#1 encryption and signing, ANSI 9.31 CS RNG) via H-500 Middleware
- Secure channel with H-500 Middleware
- Encrypted File System for storing crypto keys and objects

5.4 MIDDLEWARE

- PKCS #11 v2.20 interface
- Device management interface
- Secure channel between Applications and Middleware
- Secure channel between Middleware and Firmware
- Support for shared access to the device from multiple Applications

5.5 PHYSICAL

- | | |
|-------------------------|---------------------------------|
| ○ Size | 45 x 45 x 11 (mm) |
| ○ Weight | 35 g / 50 g (H500-CE / H500-BK) |
| ○ Operating Temperature | 0°C to 35°C (32° to 95° F) |
| ○ Storage Temperature | -5°C to 40°C (23° to 104° F) |
| ○ Operating Humidity | 5% to 90% (noncondensing) |
| ○ Storage Humidity | 10% to 80% (noncondensing) |
| ○ Sequential Read Rate | up to 10 MB/s |
| ○ Sequential Write Rate | up to 4 MB/s |
| ○ Memory Endurance | 10,000 Program/Erase Cycles |
| ○ Data Retention | JEDEC compliant |



6. H500-CE/BK SAFETY INFORMATION



WARNING

Observe the following precautions to avoid a device explosion or fire:

- Do not drop, disassemble, open, crush, bend, deform, puncture, shred, microwave, incinerate or paint the H500-CE/BK device.
- Do not insert foreign objects into any opening on the device, such as the USB port.
- Do not use the device if it has been damaged—for example, if cracked, punctured or harmed by water. Disassembling or puncturing the battery can cause an explosion or fire.
- Do not dry the device with an external heat source such as a microwave oven or hair dryer.



WARNING

- Do not place naked flame sources, such as lighted candles, on or near the device.
- When charging the device, do not handle the plug or charger with wet hands. Failure to observe this precaution could result in electric shock.

6.1 CERTIFICATIONS AND COMPLIANCE MARKINGS



This symbol means that according to local laws and regulations the H500-CE/BK device should be disposed of separately from household waste. When the H500-CE/BK reaches its end of life, take it to a collection point designated by local authorities. Some collection points accept products for free. The separate collection and recycling of the H500-CE/BK at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.



All the components and solder alloys used in the H500-CE/BK comply with RoHS directive 2011/65/EU, aimed at preventing all new electrical and electronic equipment placed on the market in the European Economic Area from containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE).



The H500-CE/BK device complies with the CE marking directive and has been tested and found to comply with the standards required by the Council Directive of RED Directive 2014/53/EU.



FCC STATEMENT

The H500-CE/BK device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment under Federal Communications Commission's rules.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Reorient or relocate the receiving antenna.



- Reorient or relocate the receiving antenna.
- Consult the dealer or an experienced radio/TV technician for help

In order to maintain compliance with FCC regulations shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio & television reception.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

ELECTRICAL RATINGS

5 V  500 mA

Powered by 3.7 V Li-ion battery

6.2 RESOURCES AND CUSTOMER SUPPORT

You can find the Terms of Use, One-Year Limited Warranty, Customer Support contact information, and other applicable terms and device information (including in other languages) at www.eisst.com/h500. For help and technical questions, please send an email to support@eisst.com.